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ABSTRACT

Two groups of 5-year-old children were evaluated using several measures of language and concept ability: Stanford-Binet, Form L-M; Preschool Inventory (PSI); Boehm Test of Basic Concepts; Peabody Picture Vocabulary Test, Form B (PPVT); and the Auditory-Vocal Automatic, Motor Encoding, Auditory-Vocal Association, and Vocal Encoding subtests of the Illinois Test of Psychlinguistic Abilities (ITPA). The Experimental (E) group (N=23) had attended the Syracuse University Children's Center for a minimum of 32 months; a Control (C) group (N=23) with limited or no preschool experience was used for matched control comparisons. The E group scored consistently higher than the C group on the measures used, and an examination of qualitative differences showed the E group to be functioning at levels which were at, or above, their chronological ages. The emphasis which the Children's Center places on language and cognitive developments can account for these results, and suggests that long term attendance in such a program is desirable. (Author/AJ)

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Concept and Language Development of a Group of Five Year Olds Who Have Attended the Syracuse University Children's Center Intervention Program[1]

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Research designed to assess the effects of compensatory education in children of preschool age from low income homes has typically used research paradigms which are pretest and posttest in nature. Another favored design is to use experimental groups (i.e., children in intervention programs) versus control groups (i.e., children not in intervention programs). This paper will not exploit a new methodology, nor will it report any new and dramatic way to conduct intervention research. It will, rather, report the results of a study done using children who have attended the Syracuse University Children's Center for a lengthy period of time, and a group comprised of children who have attended a summer Head Start program or who have had no preschool experience at all. The logistics of matched control research are widely known and acknowledged as being difficult to carry out in the absence of a captive population. We have, therefore, had to drop the major variable of a group with no preschool at all, and to institute the variable of limited preschool. In this sense, this paper parallels one that was presented at these meetings in 1968 by Prentice and Bieri. These authors studied intellectual development in culturally deprived children who were attending day care programs. One group, the "old group, had attended day care centers for no less than one year ($\bar{X}$=14 months); the comparison, or "new" group, had attended day care centers for less than six months ($\bar{X}$=3 months). Significant differences were found between Stanford-Binet IQ's for the two groups,

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with the "old" group scoring higher than the "new" group; similar results were found for IQ's based on the Draw-A-Man test. Apart from the typical accolade that measurable intellectual growth may occur in response to attendance in day care programs, Prentice and Bieri attributed these results to the stable and consistent environments the day care centers provided and the emphasis on language involved in the day care centers' curricula.

There is probably little need here to delve into the plethora of research literature which deals with the effects of compensatory preschool education. An excellent review of this can be found in Hodges and Spicker (1967). Most of the studies report positive effects of compensatory preschool education, and the typical findings are encouraging. Children who have attended preschool programs usually had higher scores on standardized tests than children who had not attended preschool programs. Klaus and Gray (1968), Karnes (1968), and Weikart (1969), to name a few, all report evidence which suggests that intellectual and linguistic development can be accelerated through attendance in preschool programs which are geared to amelioration of deficits which may accrue from conditions present in low income homes. Intellectual performance and linguistic development seem to be two interdependent variables which receive focus, and, practically speaking, are variables which are fairly easy to research (given existing psychometric methods). Bereiter and Engelmann (1966) succinctly and summarily state:

> Disadvantaged children of preschool age are typically at least a year behind in language development--in vocabulary size, sentence length, and use of grammatical structure. Indeed, in practically every aspect of language development that has been evaluated quantitatively, young disadvantaged children have been found to function at the level of average children who are a year or more younger. The other area in which disadvantaged children seem to be especially retarded is reasoning ability or logical development (p. 4, italics theirs).

These statements seem somewhat disarming, and have led to the questions to which this paper is addressed. At the Syracuse University Children's Center there has

been continued interest in a group of children (now approximately 60 months of age) who have attended the Center for a number of years.[2] Some of these children have been there for as long as 55 months. A great deal of our interest has been in the cognitive and linguistic development of these children, and this paper centers around their performance as they are about to leave the Center. The research literature mentioned before which deals with intervention programs would lead to formulation of the general hypothesis that the children who had attended the Center for a long period of time would score higher on tests of cognitive and language facility than would a group who had limited or no preschool experience. Pursuant to this hypothesis is the supposition that the emphasis on language and cognitive skills at the Center has helped these children to overcome some of the deficits which Bereiter and Engelmann state. The sustained attendance of the group at the Center, and the environment provided therein would also, hopefully, account for group differences. A matched control group with no preschool experience was not available for the total Center group. But, when looked at in light of preschool opportunities available to the community this may not be so unfortunate. The ecological validity of using a control group with some preschool experience certainly places this design in a more realistic setting than it would be had a group with no preschool experience been used. Children from a summer Head Start program were recruited and served as controls. In this respect, the prediction would be made that the Head Start group would be older than the Center group, as summer Head Start programs enroll children who are ready to enter kindergarten after the summer program. The directional nature of these hypotheses dictates one-tailed tests of significance, and these have been used throughout the analyses.

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[2] The children in this study were enrolled while the Center was under the directorship of Dr. Bettye M. Caldwell, and spent a great deal of their time under her supervision. The original group consisted of children from middle and low income homes. This paper focuses on the latter group only. Within the past two years, Center policy has changed and now only children from low income homes are recruited.

The specific interests of this paper are concept and language development of a group of five year old children who have attended the Center for a minimum of 32 months. The limitations of such a study are imposed by the existing psychometric instruments which are available to measure these abilities, and the results are based on five different tests which are typically used to evaluate language and concept development.

Method

Subjects. Two groups of subjects were involved in this study. The Experimental (E) group was comprised of 23 children who had attended the Syracuse University Children's Center for a mean of 43 months (SD=8.3, Range=32-55 months). These children had been enrolled in a full day preschool program which emphasizes cognitive and linguistic development as basic parts of its curriculum. Each child at the Center is tested annually as far as possible in the same month as his birthday. The data to be reported for the E group are the final set of test results for each child before leaving the Center (at approximately 60 months of age). All children come from low income homes. A matched control group (C) was comprised of 23 children, 19 of whom were enrolled in a summer Head Start program ($\bar{X}$=2.6 weeks at the time of testing). Four children who were part of a longitudinal control group were included in this group, none of whom has attended preschool.[3] The E group was tested many times before their final evaluation, and it is well known that gains in IQ points may be attributed in part to a practice effect. Therefore, the 60 month tests of the E group probably reflect scores which contain some elevation due to practice (four IQ points are often regarded as typical for the Stanford-Binet test re-test differential). The C group scores also may be elevated due to their Head Start experience prior to testing. A gain of approximately four IQ points has been found to be

[3] Because the ages of this group did not differ from the Head Start controls, they are included with the C group, N=23.

associated with attendance in summer Head Start (Meyer and Egeland, 1968). The mean ages and SD's for the E and C groups are presented in Table 1 using age at time of Stanford-Binet testing.

Insert Table 1 About Here

There was a statistically significant difference between the mean ages of the two groups at the time of testing ($p < .01$) on the Stanford-Binet, with the C group being approximately one month older.

Each child in the C group was matched with an E child using the following matching criteria: sex, race, age ($\pm$ 5 months),[4] presence or absence of father in the home, education and occupation of mother and father, and number of children in the home (three or less, four or more). Table 2 shows the percentages of success for the matching and also explains the matching criteria.

Insert Table 2 About Here

In selecting matches for the E group, the most difficult criteria to match were parental education and occupation. It was necessary to deviate in some cases from the characteristics of the E child if a match was appropriate on the other criteria. A match was not selected if the characteristics were more than one match "level" different. For instance, in no case would a child whose mother had completed less than nine years of schooling be matched with a child whose mother had been graduated from high school. Table 2 shows maternal occupation to be the least successful of the matches. It was found that 17 of the E mothers were employed, while only seven of the mothers of the C group were employed. The Children's Center is a day care program, while Head Start was only a half-day program. The day care program may have allowed mothers to work and this probably accounts for the poor match for this criterion.

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[4] In only three cases did age differ by this amount; the majority of deviations were by 1 or 2 months.

Procedure. The following tests were used to evaluate the two groups: Stanford-Binet, Form L-M; Preschool Inventory (PSI); Boehm Test of Basic Concepts; Peabody Picture Vocabulary Test, Form B (PPVT); and the Auditory-Vocal Automatic, Motor Encoding, Auditory-Vocal Association, and Vocal Encoding subtests of the Illinois Test of Psycholinguistic Abilities (ITPA). All children were examined individually by trained testers using standard procedures. No attempt was made to keep the order of testing consistent across subjects, as time and physical conditions did not permit this.

Results

Analyses of the results were between the E and C groups by total groups; because the N for sex and ethnic cells was small, the major analyses did not concern these variables. All analyses except for the Stanford-Binet were based on raw score; it was felt that this might be a more conservative method for analysis as the raw scores are not adjusted by age. The raw score method may also permit estimates to be made of more critical differences between the groups.

Because a prediction concerning ages was made, analysis of the differences between ages at time of testing were performed. Table 3 shows the results of matched-t tests between ages. In every case it can be seen that the C group was approximately

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Insert Table 3 About Here

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one month older than the E group; four of the five differences are statistically significant. Thus, the second prediction concerning age was confirmed, and the C group was older by about one month.

Analyses of the differences between each test are reported in Table 4. Matched-t tests were used throughout these analyses, and one-tailed tests of significance were used because of the directional nature of the hypotheses.

Insert Table 4 About Here

Stanford-Binet. Analysis of the mean differences between IQ's for the C and E groups was statistically significant at the .01 level of significance. The E group had a mean IQ of 106.0 (SD=13.8) and the C group had a mean IQ of 96.6 (SD=11.3). Neither group appears to be atypical in comparison with a normal population in respect to the mean IQ's obtained; a disturbing fact is that the groups did not differ by even one standard deviation (13.3) when this is based on the 46 Ss involved. Quantitatively, the E group was above 100 and would appear to be functioning at a higher level of cognitive competency than the C group which was below 100. The treatment group from the Center seems to have profited from their experience there, while the C group, without prolonged preschool experience is presently operating at a level beneath this group.

Preschool Inventory. The PSI was analyzed by total raw score; a separate analysis was performed on Factor II (Associative Vocabulary) of the PSI, as this factor includes items involving specific deficits often found in children from low income homes. The differences between the mean total scores show the E group to have a statistically significant higher mean score (59.8) than the C group (48.8). This difference is significant beyond the .01 level. The analysis for Associative Vocabulary shows the E group to have a statistically significant ($p < .05$) higher mean score (12.6) than the C group (10.2). Although this difference is only slightly larger than two points it reached significance. Associative Vocabulary requires the child to demonstrate awareness of the connotation of a word by carrying out some action or by associating to certain intrinsic qualities of the underlying verbal concept (Caldwell and Soule, 1966, p. 2). In this respect, this subtest, as well as the total PSI, can be viewed as an achievement test. The achievement nature of the PSI would indicate greater success with age and appropriate input.[5] Here, this is not the case. Despite the fact that the C group was significantly older, the E group performed significantly better.

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[5] Analysis of scores for a large number of children at the Center indicates that score does increase with age.

Peabody Picture Vocabulary Test. The PPVT was analyzed by raw score which permits direct assessment of the actual mean number of pictures that Ss were able to identify. The E group obtained a mean score of 46.3 (SD=6.7) and the C group obtained a mean score of 42.2 (SD=7.7), the difference between these is statistically significant at the .05 level. The C group was approximately two months older than the E group ($p < .001$) which is the greatest age difference found.

Boehm Test of Basic Concepts. Analysis of the Boehm test was based on raw scores for 11 pairs (22Ss). The discrepancy of N results from the fact that this test has been used at the Center for only a short time, and some E children left before the test was introduced. Analysis of the difference between mean raw scores for the two groups showed the E group had a statistically significant higher mean score (27.6) in their recognition of basic concepts than the C group's mean score of 22.4 (different at the .05 level). The fact that the E group scored higher may be attributed to specific training in conceptual recognition and prepositional meaning at the Center.

Illinois Test of Psycholinguistic Abilities. The ITPA was analyzed by total raw score (sum of four subtests administered); separate analyses were also performed for each subtest (Auditory-Vocal Automatic, Motor Encoding, Auditory-Vocal Association, and Vocal Encoding). The total raw score analysis, based on the four subtests, showed the E group to have a statistically significant higher mean score (51.5) than the C group (45.0). Only one of the four subtests--Auditory-Vocal Association--showed the two groups to differ significantly (means of 13.4 for the E group, 10.6 for the C group). On no subtest did the C group score higher than the E group, and in one case (Motor Encoding) the groups differed by less than one point. The E group appears to be developmentally more advanced than the C group in linguistic ability as assessed by this test. All differences between groups were in the predicted direction. Auditory-Vocal Association is the most conceptually-oriented of the four subtests used, and it is encouraging to find the E group different from the C group on this.

Discussion

It is very tempting at this point to make the unequivocal statement that the children who had attended the Children's Center for a long period of time were developmentally superior on cognitive and language measures than was a group with little or no preschool experience. This is not surprising in light of what is known about the effects of compensatory preschool education with children who have attended programs for long periods of time. Also, the emphasis which the Center places on linguistic and cognitive abilities must account for some of the E group's performance. Tasks and materials which are used with the four- and five-year-old children are specifically aimed at improving language ability, concept recognition, and cognitive skills (Honig and Stearns, 1969). When comparing the mean differences between the groups on the cognitive and language measures, it is somewhat deflating to observe that these differences were never greater than one standard deviation.

Boehm Test of Basic Concepts. The significance of the difference of five points between mean Boehm scores (yet no age difference) for 22 of the Ss suggests that the E children had experiences at the Center which increased their repertoire of recognition of basic concepts, and understanding of a one-to-one correspondence between spoken word and visual presentation. In its emphasis on linguistic development, the Children's Center staff stresses prepositional and positional concepts in order that the children may be able to understand and recognize such concepts. An item analysis of the Boehm would perhaps indicate where the groups differed in their understanding of the basic concepts involved. Unfortunately, the Boehm norms do not go below kindergarten, and comparison of these groups' scores with the norms would be suspect.

Stanford-Binet. The findings for the Stanford-Binet suggest that the E group was performing at a higher level of cognitive competence than the C group. This finding is typical and in the predicted direction. Because this paper is concerned with

concept and language development, it behooves us to look at the Binet internally to ascertain what the qualitative differences between the two groups are. Inspection of items by percent passing for years IV-6 through VII (the majority of each group being administered these items), indicated that the E group did not consistently score higher on every item than the C group. Of the 24 items included within this age span, the E group did better on 12, the C group did better on 2, and there were 10 ties (ties were within 10 per cent difference passing between the groups). The majority of the items on which the E group did better were those which involve reasoning, conceptual definition, vocabulary, and comprehension. These items require that the child utilize his storage of learned information and conceptual reasoning in order to pass. The two items on which the C group performed better were (1) Three Commissions, and (2) Patience: Rectangles. The latter item may have been passed by the C group more because of their age (although this is a year V item, it has been shown to be misplaced and too difficult for this age, cf., Meyer and Goldstein, 1969). There is no apparent explanation of why the C group did pass these items more than the E group however. The items on which the groups differed slightly or not at all were those which involve simple definitions, ability to reproduce shapes, number concepts, perceptual recognition of similarities and differences, repeating digits, and the mazes. These items appear to be appropriate to both groups with approximately equal percentages passing and failing the items. It is of interest that the E group performed better on all items at year VI as compared with the C group. There is an inherently great change in Binet items from year V to year VI, with the latter year level containing more verbal and reasoning items than the previous age level. Over 90 per cent of both groups were administered year VI so the comparisons were based on near total groups. The fact that the E group performed better than the C group would indicate that their longitudinal attendance in the Center equipped them with, or increased, the ability to deal with items which are

normatively above their chronological ages. It was more typical for the C group to reach ceiling at this age level and for the E group to ceiling at a higher level. In sum, the results of the Stanford-Binet analysis indicate the E children to be superior on cognitive and reasoning tasks, and the qualitative analysis between items indicates that their ability to utilize these strategies is superior to that of the C group.

Illinois Test of Psycholinguistic Abilities. The findings for the ITPA were congruent with the Stanford-Binet findings. Again, the E group performed better when comparison was based on the sum of the four subtests administered. When the four subtests were analyzed separately, only one--Auditory-Vocal Association--showed the two groups to be discriminatively different (this is a result similar to that reported in Karnes, 1968). This subtest requires the child ... to relate verbal symbols on a meaningful basis--in this case by analogy (McCarthy and Kirk, 1961, p. 39). Of the four subtests administered, this one stands out alone as not being an achievement test. The Auditory-Vocal Association test requires that the child decode information, process it, and encode a meaningful and directional analogy. In this respect, the E children appear to be superior. This substantiates the Binet findings where the E children performed better on reasoning tasks than the C children. These differences may be accounted for because the Children's Center staff encourages the children to be reflective in responding, spends time in pointing out environmental similarities and differences, and treats each child as rational and thought-producing. Auditory-Vocal Association involves the ability to produce logical and directional thought, and to this end the Children's Center training seems to have succeeded. The results of the other three subtests (Auditory-Vocal Automatic, Motor Encoding, Vocal Encoding) indicated the groups did not differ. Auditory-Vocal Automatic can be looked at as an achievement test for utilizing grammatical rules--the groups appear to be similarly proficient in this ability; the same applies to Motor Encoding and Vocal

Encoding. The latter test findings were somewhat surprising. It would have been expected that the E group would have done better than the C group on Vocal Encoding (the difference does approach significance at the .05 level) because of the heavy emphasis on language that the E group has experienced. The responses of the two groups differed slightly within this subtest, the main responses being shape, color, and elementary function. Interpolated Language Age scores using mean group scores showed the E group to be functioning at least at the 5-0 level; the C group, being older, never surpassed the E group in Language Age, and on two subtests were found to be functioning below their chronological age in language proficiency. Although these interpolations may be somewhat unorthodox, they do point to striking differences between the groups' language ability. Research aimed at documenting and characterizing the verbal codes of lower and middle income families (Bernstein, 1961; Hess and Shipman, 1965; Hertzig, Birch, Mendez and Thomas, 1968) has shown differences to exist between the types of grammatical structure and verbal codes used in these homes. It appears that the Children's Center has been successful, through constant verbal interchange between adult and child, to overcome some of the deficits often found in low income families, and it is encouraging to have the children function at Language Age Levels consonant with their chronological ages.

Preschool Inventory. The results for the Preschool Inventory indicated that the groups did differ significantly ($p < .01$) between total raw scores obtained and also on Factor II of this test. The Preschool Inventory, being mainly an achievement test, permits examination of specific areas where deficits in cognitive functioning may exist. The items which comprise the instrument involve basic concepts and facts, thus the PSI can be used to evaluate areas where instruction is needed. The curriculum at the Children's Center involves teaching basic concepts and facts which most children have within their repertoire by age six (suggested age range of PSI is three to six years). The E group's

performance was significantly better than the C group, which may indicate that they have gained from the Center input. Associative Vocabulary (Factor II), which involves a great deal of active thought participation on the part of the child shows the E group to be significantly higher in score (difference=2.5 points, $p < .05$). This difference is very small despite its significance.

Peabody Picture Vocabulary Test. Results for the PPVT indicated the E group to have significantly higher mean score (46.3) than the C group (42.2). The highly significant age difference ($p < .001$) with the C group being older, may here account for the difference between means being small. Interpolation of IQ's, Mental Ages and Percentiles from PPVT norms using mean ages and mean raw scores for the two groups showed the discrepancies to be even greater than the raw score means indicate. The differences were 7 points for IQ, 7 months for Mental Age difference, and 17 points for percentile differences (all differences favoring the E group). The suspected conservative nature of raw score analysis in this case seems to be borne out, and this method did show there to be statistically significant differences between the mean number of words the Ss could identify. This finding was consonant with the ITPA findings where the C group was less proficient in their linguistic ability, and also with Vocabulary from the Stanford-Binet. The latter result showed that 17 per cent more of the E group passed Vocabulary at year VI. The ability to identify the spoken word through recognition of it in a pictorial milieu is a skill in which the Center children are more proficient.

Summary and Conclusions

Two groups of children approximately 60 months of age were evaluated using several measures of language and concept ability. The E group had attended the Syracuse University Children's Center for a minimum of 32 months; a C group with limited or no preschool experience was used for matched control comparisons. The

E group scored consistently higher than the C group on the measures used, and an examination of qualitative differences showed the E group to be functioning at levels which were at, or above, their chronological ages. The emphasis which the Children's Center places on language and cognitive development can account for these results, and suggests that long term attendance in such a program is desirable.

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Table 1

Mean Ages (in months) at Time of Stanford-Binet Testing

Group	N	Mean	SD	*t* (matched)
E	23	59.1	2.4	-2.55 ($p<.01$)
C	23	60.5	2.1	

Table 2

Success of Matching (in percent)

Sex	Race	Age	Father in home	Education* Fa	Education* Mo	Occupation* Fa	Occupation* Mo	Number of Children
100	100	100	100	46	58	73	33	100

* These percents are based on educational and occupational groupings and do not represent exact level of schooling and exact occupation. No match differs by more than one educational or occupational level.

Key to Matching

1. Age. Age reported within five months of match.

2. Father in Home. Indicates whether a father was present in the home during time child was enrolled in program.

3. Education. Four educational groupings were used.

    a. Less than nine grades completed.
    b. Parent attended high school but was not graduated.
    c. Parent was graduated from high school.
    d. Parent was graduated from high school and had some education after this, e.g., some college, technical, business schooling.

4. Occupation (based on U.S. Census Index of Occupations).

    a. White Collar
    b. Skilled Worker
    c. Unskilled Worker
    d. Housewife or Unemployed

5. Number of Children. This is based on less than three or more than four children in the home including study child.

Table 3

Ages at Time of Testing

Means, Standard Deviations, and Matched-*t*'s +

Test	N (pairs)	Experimental		Control		*t* (matched)+
		Mean	SD	Mean	SD	
Stanford-Binet	23	59.1	2.4	60.5	2.1	-2.55**
PSI	22	59.5	2.3	60.6	2.1	-2.33*
PPVT	23	58.5	1.9	60.6	2.2	-4.26***
Boehm	11	59.5	1.5	60.3	1.6	-1.66
ITPA	23	58.7	2.8	60.6	2.2	-2.47*

+ one-tailed test of significance

* significant at the .05 level
** significant at the .01 level
*** significant at the .001 level

Table 4

Ten Test Variables

Mean Scores, Standard Deviations, and Matched-*t*'s +

Test	N (pairs)	Experimental		Control		*t* (matched)++
		Mean	SD	Mean	SD	
Stanford-Binet	23	106.0	13.8	96.6	11.3	2.80**
PSI	22	59.8	11.5	48.8	13.8	3.32**
PSI--Assoc. Vocab.	22	12.6	5.1	10.2	3.8	1.87*
PPVT	23	46.3	6.7	42.2	7.7	1.89*
Boehm	11	27.6	8.7	22.4	6.4	2.56*
ITPA (sum 4 tests)	23	51.5	10.5	45.0	11.3	1.83*
Aud.-Voc. Auto.		9.4	2.8	8.4	3.3	1.03
Motor Encoding		12.6	3.3	12.2	2.6	0.37
Aud.-Voc. Assoc.		13.4	3.8	10.6	4.3	2.49*
Vocal Encoding		15.96	4.5	13.4	4.8	1.60

\+ based on raw score analysis except for Binet which used IQ
++ one-tailed test of significance

* significant at the .05 level
** significant at the .01 level